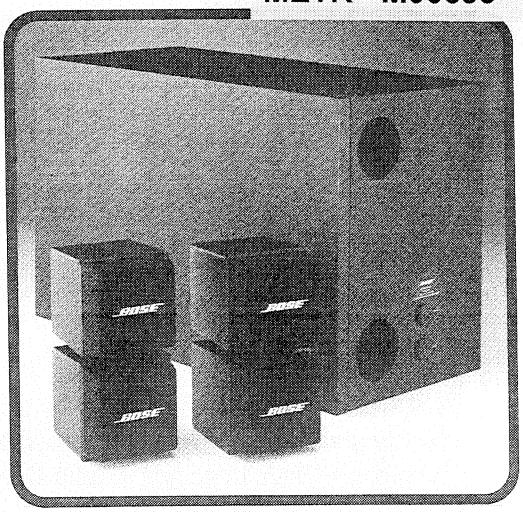
METR - M00695

BOSE®
Better sound through research.



2683-2

ACOUSTIMASS® POWERED SPEAKER SYSTEM

CAUTION

1. Parts identified by the ⚠ symbol on the schematic diagram and the parts list are critical for safety. Use only replacement parts that have critical characteristics recommended by the manufacturer.
2. Make leakage-current or resistance measurements to determine that exposed parts are acceptably insulated from the supply circuit before returning the unit to the customer.

CAUTION:- SERVICE ON THIS UNIT SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL!!

PLEASE, READ CAREFULLY BEFORE ATTEMPTING TO SERVICE UNIT !!

• SPECIFICATIONS

FEATURES
Acoustimass® Speaker System
Dynamic Equalization
Built-In Amplification
Bi-amplified System
Automatic Turn-On/Turn-Off

FINISH
Acoustimass® Module:
Scratch-resistant Vinyl Veneer
Cube Array: Polymer Finish

DRIVER COMPLEMENT
Two (2) 6" low-frequency drivers
Four (4) 2.5" wide-range,
magnetically shielded drivers in cube arrays

INPUT SENSITIVITY
0.6 Vrms @ 1 KHz

DIMENSIONS
Acoustimass Module: 20.1" H x 12.6" W x 9.1" D (51.0 cm x 32.1 cm x 23.1 cm)
Cube Array: 7.4" H x 3.6" W x 4.6" D (18.7 cm x 9.2 cm x 11.7 cm)

POWER (Mains) **SUPPLY**
120 Volts ~60 Hz 350 W Max.
220 Volts ~50 Hz 350 W Max.
240 Volts ~50 Hz 350 W Max.

WEIGHT
43 Lbs

**** Design and specifications subject to change without notice for improvements.***

Service Manual

THEORY OF OPERATION

The following technical note references to the schematic diagram(Page # 26) and block diagram (Page # 25).

GENERAL

The AM-5P® electronics module powers the AM-5P loudspeaker system, which is a derivative of the highly successful AM-5® loudspeaker system. As a powered system, the AM-5P is meant to be used with the BOSE LifeStyle Music Center audio source.

The powered AM-5P offers many advantages over a separately powered AM-5 system. These include:

- Automatic turn-on/ turn-off (audio sense or DC signal from LifeStyle Music Center)
- Automatic (BOSE patented) dynamic equalization
- Bi-amplification for better power distribution to speakers
- High Efficiency Class G Power Amp stages (100W + 50W +50W)
- Active equalization for smoother frequency response
- Amplifier short-circuit protection
- Bass/treble room compensation controls
- Differential input stage (to reject induced interference)
- Dynamic compressor to prevent amplifier output overload distortion

BLOCK DIAGRAM DESCRIPTION

Refer to block diagram and schematic(Pages # 25 & 26). For discussion of L/R channels, only right channel is discussed (operation of left channel is identical).

POWER SUPPLY

Two (2) power supplies are used in the AM-5P. One is a low power regulated ±15 VDC supply used to power the signal processing circuitry, the other is the high voltage main power supply used to power the three **Class G** power amplifier stages. Two voltages are provided for class G operation, ± **20 VDC** and ± **40 VDC**. The ±**15 VDC** supply always remains energized as long as the unit is plugged into the wall. The main power amplifier supply is turned **on** and **off** by the audio sensing circuit (discussed elsewhere).

DIFF. AMP.

Audio input at the **DIN** connector connects directly to left and right differential amplifier inputs buffers. This stage neatly accomplishes several functions: provides rejection of common-mode interference (like hum) that might be picked up by the long audio cable between the AM-5P and CD-10; provides input overload protection thru diodes (D101-104); strips off radio frequency interference thru C203, 204; provides dc blockage by C201, 202; and lastly provides 10 dB gain thru U201 op.-amp.

COMPRESSOR

U201 (pins 5,6,7) under normal audio conditions, operates as a conventional inverting op.-amp. stage with a gain of 6 dB. However, just before clipping occurs at the speaker outputs, transistor

U205 (pins 5,6,7) receives a turn-on signal from the compressor detect stage. When this happens the transistor acts as a variable resistor to ground, and with R207 forms a resistor divider network that attenuates the audio signal. The amount of attentuation and timing action is carefully controlled by the compressor detect stage (discussed later).

AUDIO SENSE

The AM-5P remains in standby mode until audio is detected at its inputs, or if it receives a **dc turn-on voltage** from the CD-10 through pin 1 of DIN connector input. Audio sense occurs after the compressor stage where left and right signals are summed through resistors R222 and R224. The signal is pre-amplified by inverting op-amp summer stage U203 (pins 1,2,3) and presented at pin 1 input of turn-on chip U204 (NJM2072). Diodes D109 and D110 are necessary to prevent overload of the turn-on chip at high volume level. With audio input ≥ 0.3 mVrms, U203 pin 7 goes high and through diode D111 turns on transistor **Q401** which triggers relay **K1** to close and turn **on** the main power transformer. Turn-on time of the power amplifier section is 80 ms. Without the CD-10 turn-on voltage or audio input, U203 pin 7 will go low after approximately 90 seconds and turn **off** relay K1 and the main supply. This turn-off time is set by capacitor C217.

TONE CONTROL

A separate tone control PCB is attach to the main PCB through a seven (7) conductor ribbon cable connector. Power is brought out from the main board. The tone control is a standard Baxandall circuit with ± 6 dB bass and treble controls.

HF. EQUALIZATION

High frequency equalization is achieved through four (4) cascaded active EQ. stages comprised by U101 thru U104. The purpose of equalization is two-fold. One, it provide very sharp low frequency roll-off below **200 Hz** (the crossover frequency) to prevent overload of the L/R speakers; and two, it provide finely tailored correction in the L/R speaker pass band so that overall frequency response of the system is correct. Refer to the frequency response curves of the individual and total responses of these stages on page #17.

AUTOMATIC DYNAMIC LOUDNESS

In order to compensate for the ear's loss of bass response at low listening levels, a BOSE patented automatic loudness circuit is employed. This circuit automatically senses the volume level of the incoming audio signal and properly adjusts the amount of low frequency bass boost. When volume level is high, the frequency response of the circuit is flat. When the volume levels decrease the low frequency gain is increased with max. boost at **55 Hz**. This correct loudness contour has been precisely determined through psycho-acoustic testing, and should not be confused with cheaper imitations. Circuit operation is as follows. Audio at U201 and U202 (pin 7) is summed by resistors R211 and R220. The AC signal at pin 5 of level detect op. amp. U203 is negative peak detected and is presented across emitter resistor R236. The peak detected signal has a 4 second hold time and a 4 sec /10 dB release time constant which is developed within the feedback loop of U203 (pins 5,6, 7). The voltage across R236 is converted to a current source through transistor Q203, and flows into pin 5 of "transconductance" amp. U206. U206 and U207 (pins 1,2,3) form a variable gain stage (delta-G). Action is such that increased current into pin 5 of U206 causes gain of the stage to decrease. The variable gain stage is followed by a **55 Hz**, (Q=2.3) band pass filter (U207 pins 5,6,7). The output of this stage is summed through R247 with the flat response signal present at

R248 to create a composite frequency response curve with varying levels of **55 Hz** boost. The overall desired loudness contour response is visible at U208 pin 1. (Refer to the frequency response curves on page #20, Graph 4)

LF. EQUALIZATION

A single stage sallen-key 2nd order high-pass/low pass network (U208 pins 5,6,7) provides bass channel equalization and low frequency roll-off to prevent subsonic low frequency overload. Refer to the frequency response curves of the individual and total responses of these stages on page #17.

PWR. AMP.

All three (3) power amplifiers are of identical topology and utilize high efficiency Class G power amp. stages. L/R amp. channels are identical 50 Watt Amplifiers. The bass channel is 100W, and because of its higher power uses more powerful output transistors and slightly different component values, but operation is otherwise the same. The basic concept behind Class G operation is simple. It takes advantage of the fact that music, even at loud volume settings, has only brief moments where peak voltage from the amplifier is needed. Unfortunately, with conventional Class B amplifiers, this peak voltage is always supplied to the output transistors and most of the time is wasted as heat. The result is that larger and more expensive power supplies and heatsinks are needed (or power output transistors, resulting in decreased reliability). With Class G however, the amplifier operates off of two different power supply voltages. When the music is low the amp. runs off of the low voltage supply, thus conserving power. When musical peaks occur, the amplifier "intelligently" switches to the higher voltage supply. On average, this voltage "conservation" translates to efficiency almost double that of class B. Detailed operation of the amp. is as follows: First it is important to understand that a Class G amp. is really just a class B amp. with special circuitry added to it to allow switching between two different power supply voltages. In the case of the bass amplifier, this switching action is accomplished on positive peaks by Q335, Q334, and Q333 and on negative peaks by Q342,343, and Q344. A positive signal at op.-amp. input U303 pin 3 causes the op.-amp. supply current to flow into pin 7 through Q336. Q336 is used simply to buffer the + 40V high voltage amp. supply down to a safe +15V for the op.-amp. This current also flows through R353 and diode D325. R353 and D325, together with driver transistor Q332 and R355 form a current mirror which multiplies the current through Q336 by the ratio R353/R355. This increased current flows through driver transistor Q332, and into the base of output transistor Q337. The **hFE** current gain of output transistor Q337 (about 40) provides final current amplification before reaching speaker output. Class G switching action occurs as follows: the voltage at the anode of D330 tracks one diode drop above the output voltage of the amp. When this voltage exceeds the nominal + 20V power supply rail transistor Q335 conducts. This in turn causes Q334 and Q333 to turn on. When Q333 turns on it acts as a switch to connect the + 40V supply present at its emitter to the collector of output transistor Q337. When this occurs, the + 20V supply, normally fed through diode D329 is turned off because the + 40V causes the diode to be reversed biased. When the music demand (voltage) drops below + 20V the reverse happens and the + 40V supply is turned off and the + 20V supply is turned on again. The power amplifier topology is complementary and therefore operation of the amplifier on negative half cycles is identical to positive cycle operation except for component reference designations. Refer to the frequency response curves of the individual and total responses of these stages on pages # 17,18 and 19.

SHORT-CIRCUIT PROTECTION

Left and Right power amp. stages have short circuit protection. This is necessary to prevent damage to the amplifier from customer misuse that might occur, for instance, if the customer were to accidentally short the speaker cable wires that connect to the cube speakers. If this happens all three (3) amplifiers will momentarily mute for about 3-4 seconds and continue to mute until the abnormal condition is removed. This is achieved with the use of a 0.12 Ω resistor (R313 for right channel) in series with each amplifier output. Under normal conditions peak current to the 8 Ω speakers should never exceed 3.5 amperes. If current flow exceeds 4.5 amperes, then Q309 will conduct and trigger monostable multivibrator circuit U401 (pins 1,2,3). Pin 1 will go high (for about three seconds) and through diode D406 will trigger mute transistors Q409 and Q408. Turn-on of Q408 causes all three (3) amplifiers to mute. Referring to the bass power amplifier, actual muting occurs by turning on transistors Q331 and Q340, which cause both driver transistors (Q332 and Q341) to turn OFF. When the driver transistors are off there can be no current flow through the output transistors.

DC OFFSET PROTECTION

If any one of the three (3) amplifier channels should fail it is likely that a large **dc voltage** will occur at the output of that channel. If this occurs the DC offset detect circuit will cause the AM-5P main power supply to shut down. It will remain shut-down until the unit is unplugged from the power source. This provides a safe indication to the customer that the unit requires service. Detailed operation is as follows: Outputs of each amplifier are summed by resistors R407, R408, R409. For a sustained DC offset C401 will charge either negative or positive. A positive offset will trigger Q402, a negative offset will trigger Q405. This in turn causes Q403 to conduct and latch Q404 permanently on. Q402 then shorts base of Q401 to ground. Q401 is the transistor that controls turn-on of relay K1 that is used to energize power transformer T2. Therefore, when Q401 is disabled main power is shut down.

COMPRESSOR DETECT

The output of each amplifier is half-wave detected through diodes D409, D410, D411 respectively. This voltage is divided down by R422 and R423 and presented at emitter of Q410. Power supply voltage is similarly divided down by R425 and R426 and presented at the base of Q410. Diodes D419 and D420 simulate the saturation voltage drop that occurs in the power amp. stage. Therefore, when audio output of any amplifier comes within two volts of the instantaneous power supply voltage, Q410 will conduct, which signals the compressor (limiter) to act. Current from Q410 charges hold capacitor C405 and release capacitor C422. Voltage at C405 is buffered by transistor U205 (pins 1,2,3) and decreased down to a logarithmic voltage by resistor R438 and diode U205 (pins 12,13, 14). This voltage is then presented to the base of compressor transistors U205 (pins 5,6,7) and U205 (pins 8,9,10) which are described in the compressor section. The DC control voltage present across capacitor C405 is derived through the use of an improved hold and release characteristic resulting in lower compressor distortion. In conventional limiters this DC control voltage is derived by a simple series diode and parallel RC network to ground. Unfortunately, for low frequency overload, this results in substantial ripple voltage present on the DC gain control voltage. This results in the all too common problem of mid-range voices or instruments being badly "modulated" by low frequency overload. This problem is solved by having two separate capacitors, one that "holds" the smooth DC voltage just long enough to prevent low frequency ripple (approximately 440 ms and the other (C422) that quickly releases the hold cap (through diode D412) at the proper time to maintain overall 100 ms release time.

BOSE ACOUSTIMASS® POWERED SPEAKER SYSTEM

SERVICE BULLENTIN

DATE: August 23,1990

SYMPTOM:

AM-5P® Bass Module fails to turn ON when the CD-10 is powered On and does not turn ON when an audio signal is present at the AM-5P®DIN connector input.

STEP 1. Check the Obvious:

a. Line cord plugged In.
b. Power switch set to the ON position (non-USA units only)
c. Cable between CD-10 and AM-5P properly connected, 3.5 mm stereo mini plug connected to CD-10 serial data output jack.

STEP 2. Perform the following experiment:

a. Turn the power switch OFF (when applicable).
b. Wait ten (10) seconds.
c. Turn the power switch ON.
d. Check if the system is now reproducing the audio.

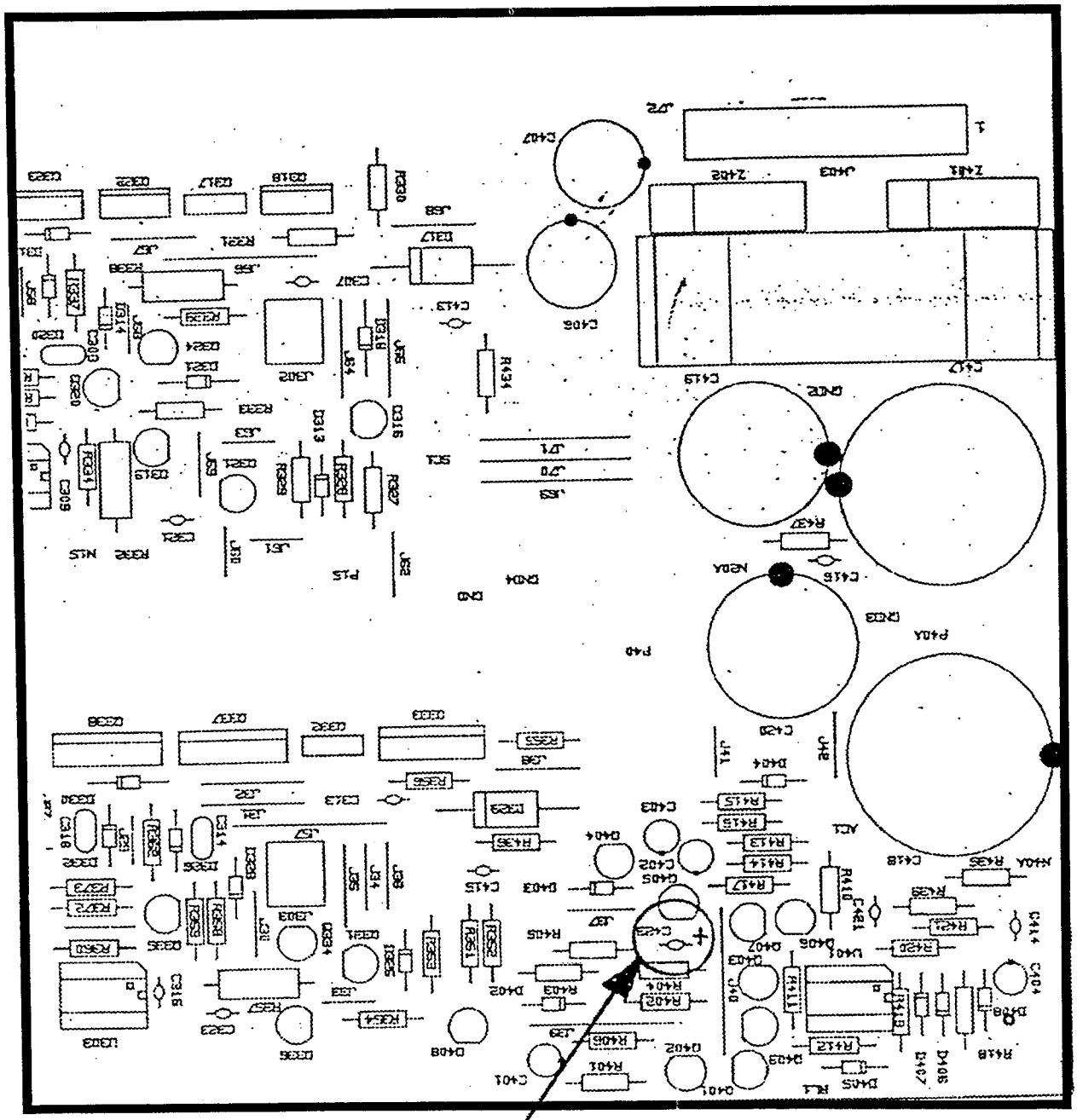
NOTE: If step 2 solves the problem, it indicates that the amplifier DC offset protection circuit was inadvertently (false) triggered, causing the amplifier output stage to shutdown. It is likely that either a power line transient or a local discharge of static electricity is the cause of the false trigger. If the unit fails to turn ON after repeating step 2, it indicates a major malfunction in either the power supply or amplifier stages and should be further diagnosed or returned to **Bose Service Department.**
Att'n: Mike Bishop

SOLUTION:

To prevent occasional False Shutdown of the bass module due to power line transients or static electricity, it is necessary to reduce the sensitivity of the DC offset detector stage by increasing the RC time constant at the base stage of transistor Q403. This is accomplished as follows (See PCB layout on attached page):

Change C423; **From:** 0.1 µF Ceramic
To: 1.0 µF Electrolytic (≥ 16 Volts)

Portion of AM-5P® PCB



Change C423; **From:** 0.1 µF Ceramic (note Polarity)
To: 1.0 µF Electrolytic (≥ 16 Volts)

DISASSEMBLY PROCEDURE

Cube Array Module

1. GRILLE REMOVAL:
To remove the grille, grasp all four (4) sides simultaneously, squeeze and pull the grille away from the enclosure. Once the grille has been remove the tweeter is exposed.

2. TWEETER REMOVAL:
Remove the four (4) Phillips screws that secure the tweeter and baffle to the enclosure of the appropriate speaker. Lift the tweeter straight up from the enclosure.

NOTE: The tweeters are wired in series.

3. TERMINAL CUP REMOVAL:
Perform the two previous steps of this procedure first. Carefully lift the tweeter away from the enclosure (either **top or bottom**), remove the cotton filling and this exposes terminal cup. Using a 1/4" nut driver remove the two screws that secure the terminal cup to the enclosure.

ASSEMBLY PROCEDURE

Cube Array Module

1. TERMINAL CUP REPLACEMENT:
Unwrap the wires from the wire terminals of the terminal cup. Connect the wires to the replacement terminal cup. Using a 1/4" nut driver replace the two screws that secure the terminal cup to the enclosure.

2. TWEETER REPLACEMENT:
Unwrap the wires from the speaker terminals. Connect the wires to the replacement driver. (See Note below.) Using a Phillips screw driver replace the four (4) screws that secure tweeter and baffle to the enclosure.

NOTE: The gray wire is connected to the positive terminal and black wire is connected to the negative terminal of the **TOP cube tweeter.** The red wire is connected to the positive terminal and gray wire is connected to the negative terminal of the **Bottom cube tweeter.**

The Cube Array tweeters are wired out of phase with the Acoustimass Woofers.

3. GRILLE REPLACEMENT:
Carefully align the grille with the front of the enclosure. Apply slight pressure to the front of the grille until it snaps into place. Check the grille to ensure it is secure.

DISASSEMBLY PROCEDURE
Acoustimass Powered Speaker

1. BACK PANEL REMOVAL:

NOTE: Place the unit on a flat surface with the port side (see Figure 1) parallel to your left hand and the power cord parallel to your right hand.

Using a Phillips screw driver remove the sixteen (16) screws located around the edges of the Acoustimass Bass module enclosure. After the screws has been removed, grasp the edge of the heat-sink that is furthest away from you, and rotate the back panel towards you. As you rotate the panel unclip the cables for both the woofers and tone control PCB. (This exposes the Woofers, Toner Control PCB, Transformers and Amplifier PCB).

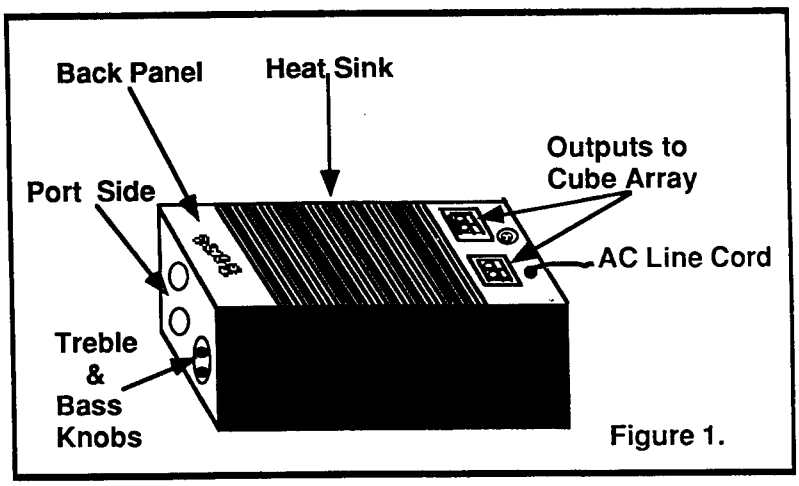


Figure 1.

2. WOOFER REMOVAL:
Using a 1/4" hex driver remove the four (4) screws that secure the appropriate woofer to the bass module enclosure. Untwist any twisted pairs and carefully lift the woofer away from the enclosure.

NOTE: The woofers are wired in parallel.

3. AMPLIFIER PCB REMOVAL:
Perform the back panel removal step of disassembly procedure first. Using a 9/32" nut driver remove the nine (9) hex nuts that secure the amplifier to the back panel, then using a Phillips screw driver remove the four (4) screws that secure the two on board heat-sinks to the back panel. Unplug all the cables from their male counter parts on the amplifier PCB. After all the cables has been removed, three sets of wires will still connected (hard-wired) to the amplifier PCB. De-solder these wires that are still connected to the PCB. After all the wires and cables have been disconnected, carefully lift the amplifier away from the back panel.

4. TONE CONTROL PCB REMOVAL:
Perform the back panel removal step of disassembly procedure first. Remove the two (treble and bass) knobs/controls that are located on the **port side** of the module enclosure (See Figure 1). Using a #10 M nut driver remove the nuts that secure potentiometer shafts that protrude from the tone control PCB. After the nuts have been removed push the shafts inward to free the tone control PCB from the cabinet.

5. MAINS TRANSFORMER REMOVAL:
Perform the back panel removal step of disassembly procedure first. Unclip the two (6 and 2 pin) connectors from the amplifier PCB. Using a 5/16" nut driver remove the four (4) hex nuts that secure the transformer to the back panel. Once all the nuts have been removed, carefully lift the transformer away from the back panel.

ASSEMBLY PROCEDURE

Acoustimass Powered Speaker

1.WOOFER REPLACEMENT:
Unwrap the wires from the speaker terminals of the suspected defective woofer. Connect the wires to their appropriate speaker terminals on the replacement woofer. Remount the replacement woofer in the cabinet, and using a 1/4" hex driver secure the four (4) screws (See Note Below). **Perform step #5** of the assembly procedure to complete unit.

NOTE: The red wire from the **cable** is connected to the positive speaker terminal of the left woofer and the black wire from the **cable** is connected to the negative speaker terminal of the right woofer. The green wire is connected between the negative speaker terminals of both woofers, and the yellow wire is connected between the positive speaker terminal of both woofers.

2. TONE CONTROL PCB REPLACEMENT:
Place the PCB parallel to the back panel, turn it so that the circuit side is clearly visible. Align the potentiometer shafts with the holes on the port side of the cabinet, add the washers and the hex nuts. Using a #10 M nut driver secure the hex nuts. (Do **not** over-tighten, it can cause damage to the PCB.) Remount the knobs.

3. AMPLIFIER PCB REPLACEMENT:
Solder the wires that need to be hard-wired to the amplifier. Add heat-sink compound to the bottom of the two (2) heat-sink couplers on the amplifier. Align the amplifier PCB screw holes with the protruding screws on the back panel. Using the hex nuts and the stand-offs (heat sink) secure the amplifier PCB to the back panel, then connect the appropriate cables (female connectors to their male counter parts). See **Connection Chart** below.

4. MAINS TRANSFORMER REPLACEMENT:
Align the transformer screw holes with the protruding screws on the back panel. Using a nut driver secure the transformer with the four hex nuts to the back panel, then connect the primary & secondary cables (ex. J402 and J403 respectively).

5. BACK PANEL REPLACEMENT:
Align the back panel screw holes with the screw holes on the cabinet. Using a Phillips screw driver secure the back panel to the cabinet using the sixteen (16) screws.

AMPLIFIER CONNECTION CHART

The following points (wires) are hardwired to the amplifier PCB.

1. Pin 1 of the DIN input connector is connected to **DC 8** of the amplifier PCB.
2. Black wire (input) of the" KEEP ALIVE" transformer connected to **T403** of the amplifier PCB.
3. Red wire (input) of the" KEEP ALIVE" transformer connected to **T404** of the amplifier PCB.
4. Blue wire (output) of the" KEEP ALIVE" transformer connected to **T405** of the amplifier PCB.
5. White wires (output) of the" KEEP ALIVE" transformer connected to **T401** & **T402** of the amplifier PCB.

These cables are connected to the following points on the amplifier PCB.

1. 4 pin cable from the audio input connected to socket **J201.**
2. 7 pin ribbon cable from the tone control PCB connected to **J101.**
3. 2 pin cable from the woofers connected to **J303.**
4. 2 pin cable from the left cube array input connected to **J302.**
5. 2 pin cable from the right cube array input connected to **J301.**
6. AC input connect to **J401.**
7. Input of the Mains Transformer connected to **J402.**
8. Output of the Mains Transformer connected to **J403.**

POWER AMPLIFIER TROUBLESHOOTING GUIDE

The following information is provided to aid the service personnel in specific troubleshooting of the AM-5P power amplifier section. For more general information regarding amplifier operation, please refer to the theory of operation section.

The amplifier stages in the AM-5P have been designed to be highly reliable. However, if a failure occurs either by abuse or random part failure there is appropriate diagnostic technique that will minimize troubleshooting effort.

First it is important to note that when failure does occur it usually involves several components, all of which must be appropriately replaced to avoid repeat damage. For example, referring to the bass amplifier, if driver transistor Q332 is shorted it is likely that damage has also occurred to driver transistor Q341, fusing resistors R355 and R370, and diode D330. Fusing resistors R353 and R368 should also be automatically checked. Fusing resistors are easily recognized by their blue color.

Second, because the AM-5P power supply is capable of supplying several hundred watts of power under abnormal fault conditions, an amplifier known to defective should never be powered up before repair is attempted. This can cause further unnecessary damage. Instead, ohmmeter measurements of fusing resistors and key transistors (on diode range) should be made with the unit unpowered, to detect bad parts. The following table summarizes nominal (in circuit) resistance measurements for the driver and output transistors on a "good" unit made with a FLUKE 8060A DVM set on diode range. Results should not differ by more ± 10%.

In circuit resistance measurements		**B-E**	**B-C**	**C-E**
Bass Amplifier	Q333 PNP Output	520 Ω	520 Ω	∞
	Q338 PNP Output	550 Ω	550 Ω	∞
	Q337 NPN Output	520 Ω	520 Ω	∞
	Q344 NPN Output	500 Ω	500 Ω	∞
	Q332 PNP Driver	350 Ω	590 Ω	∞
	Q341 NPN Driver	350 Ω	590 Ω	∞
Right Amplifier	Q322 NPN Output	600 Ω	600 Ω	∞
	Q330 NPN Output	570 Ω	570 Ω	∞
	Q318 PNP Output	560 Ω	560 Ω	∞
	Q323 PNP Output	590 Ω	590 Ω	∞
	Q317 PNP Driver	420 Ω	590 Ω	∞
	Q327 NPN Driver	420 Ω	590 Ω	∞

(Note: Similar results for left amplifier).

TEST PROCEDURE AM-5P® Amplifier

EQUIPMENT REQUIRED: Shorting Plug[1] , two (2) 8 Ω/50W and a 4Ω/100W resistors, Signal (sine wave) Generator[2] , dB Meter, Oscilloscope, Variac, a ± 5 VDC Source, and a RMS Voltmeter.

Note: If an Audio/Distortion Analyzer or equivalent is available use it instead of the following:
Signal Generator
dB Meter
Voltmeter.

The Oscilloscope and Voltmeter connections are optional except on the Short Circuit Test. The Oscilloscope will be needed when performing the Short Circuit Test.

NOTE: The two (2) 8 Ω/50W resistive loads are connected at the Cube Array output terminals. The 4 Ω/100W resistive load is connected across (J303) woofer output.

Remove the AM-5P® Amplifier from the cabinet, refer to the disassembly procedure on page # 7.

CONVENTIONAL SET-UP PROCEDURE

1. Plug the "shorting" plug into J101 (refer to Figure 1 and the back page).
2. Connect the respective loads across the outputs. (Refer to the note above or Figure 2)
3. Connect the output of the Signal Generator to the inputs (left & right channels) of the UUT.
4. Connect the input of the dB Meter across the appropriate resistive load. (Refer to figure 3)
5. Connect the input of the Voltmeter or Oscilloscope across the output of the signal generator.
6. Connect the AC power cord of the UUT to the Variac.
7. Connect the power cords of the bench equipment to a power strip and apply power.
8. Toggle the power switch on the Variac to ON, and adjust the voltage to desired level[3] .

UNCONVENTIONAL SET-UP PROCEDURE

** If, an Audio/Distortion Analyzer or equivalent, is been use perform steps 1,2,6 to 8 of the conventional procedure. (Refer to Figure 3)

3. Connect the output(high) from the Analyzer to the inputs (left & right channels) of the UUT.
4. Connect the input (high) from the Analyzer to the resistive load of the appropriate channel been tested.

TEST

All Steps in the test procedure are written for the conventional set-up.
Refer to Figures 2 or 3 for assistance.

Common Mode Rejection Ratio:

9. Adjust the frequency of the Signal Generator to **60 Hz** and the amplitudel to **220 mVrms**.
10. Measure the output at both cube array resistive loads (**8 Ω/50W**).

OUTPUT: < 35 dB on both Channels

BOSE ACOUSTIMASS® POWERED SPEAKER SYSTEM

BASS CHANNEL:

DC Offset.

9. Electrically short the audio inputs on the DIN connector of the UUT (**Pins #2 & #3, #2 & #5**).
10. Using the voltmeter measure the voltage across the Bass channel resistive load (4 Ω/100W).

OUTPUT: < 50 mVDC

Reference Gain:

9. Adjust the frequency of the Signal Generator to **100 Hz** and the amplitude to **30 mVrms** or 0 dB.
10. Using the dB Meter measure the Gain across the Bass channel resistive load (4 Ω/100W).

OUTPUT: 34.7 dB ± 1.8 dB

Relative Frequency Response (Reference to 100 Hz Gain)**:**

9. Adjust the frequency of the Signal Generator to **100 Hz** and the amplitude to **30 mVrms.**
10. Using the dB Meter measure the Gain across the Bass channel resistive load (**4 Ω/100W**).
11. Perform the steps in the chart below.

FREQUENCY		RELATIVE RESPONSE
20 Hz		-10.0 dB ± 1.5 dB
55 Hz		5.0 dB ± 1.8 dB
200 Hz		-1.0 dB ± 1.5 dB
400 Hz	**CHART 1**	-11.4 dB ± 1.5 dB

Dynamic Equalizer Gain:

9. Adjust the frequency of the Signal Generator to **55 Hz** and the amplitude to **200 mVrms** or 0 dB.
10. Using the dB Meter measure the Gain across the Bass channel resistive load (**4 Ω/100W**).

OUTPUT: 35.1 dB ± 1.8 dB

Small Signal Distortion:

9. Adjust the frequency of the Signal Generator to **100 Hz** and the amplitude to **37 mVrms.**
10. Using the dB Meter measure the distortion at the Bass channel resistive load (**4 Ω/100W**).

OUTPUT: < 0.1 % THD

Large Signal Distortion:

9. Adjust the frequency of the Signal Generator to **100 Hz** and the amplitude to **360 mVrms.**
10. Using the dB Meter measure the distortion at the Bass channel resistive load (**4 Ω/100W**).

OUTPUT: < 0.2 % THD

TWIDDLER CHANNEL

DC OFFSET:

9. Electrically short the audio inputs on the DIN connector of the UUT (**Pins #2 & #3, #2 & #5**).
10. Using the voltmeter measure the voltage across both Twiddler channel resistive loads (8 Ω/50W).

OUTPUT: < 50 mVDC

Reference Gain:

9. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude to **30 mVrms** or 0 dB.
10. Using the dB Meter measure the Gain across both Twiddler channel resistive loads (8 Ω/50W).

OUTPUT: 30.5 dB ±1.5 dB (re. 30 mV)

Relative Frequency Response:

1. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude to **30 mVrms.**
2. Using the dB Meter measure the Gain across both Twiddler channel resistive loads (8 Ω/50W).
3. Perform the steps in the chart below.(Response referenced to Gain @ 1.0 KHz)

FREQUENCY		RELATIVE RESPONSE
100 Hz		-17.4 dB ± 1.5 dB
200 Hz		1.4 dB ± 1.5 dB
350 Hz		-3.3 dB ± 1.5 dB
3.2 KHz		-3.6 dB ± 1.5 dB
9.0 KHz		2.7 dB ± 1.5 dB
20 KHz	**CHART 2**	-8.6 dB ± 1.5 dB

Small Signal Distortion:

9. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude to **58 mVrms.**
10. Using the distortion Meter measure the distortion at both Twiddler channel resistive loads (**8 Ω/50W**).

OUTPUT: < 0.1 % THD, 400 Hz HPF

Large Signal Distortion:

1. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude to **534 mVrms.**
2. Using the distortion Meter measure the distortion at both Twiddler channel resistive loads (**8 Ω/50W**).

OUTPUT: < 0.2 % THD

Channel Separation:

9. Disconnect the Signal Generator output from the right channel input.
10. Adjust the frequency of the Signal Generator to **10 KHz** and the amplitude to **30 mVrms**.
11. Using the dB meter measure the Gain across both Twiddler channel resistive loads (**8 Ω/50W**).

OUTPUT: Right Channel Gain should be 30 dB less than Left Channel Gain.

Repeat steps 9 to 11 for the left channel input.

OUTPUT: Left Channel Gain should be 30 dB less than Right Channel Gain.

Compressor Test:

9. Re-connect the Signal Generator output to the right channel input.
10. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude to **1.8 Vrms**.
11. Using the distortion Meter measure the distortion at both Twiddler channel resistive loads (**8 Ω/50W**).

OUTPUT: Both Channels ≤ 3.0%

Short Circuit Protection:

9. Adjust the frequency of the Signal Generator to **1.0 KHz** and the amplitude until there is **4.0 Vrms** on either Twiddler channel resistive load (**8 Ω/50W**).
10. Momentarily short (~ 200 mS) either output and observe the effect on an Oscilloscope.
11. Verify that the amplitude goes to zero (0) for a period of 2 to 3 seconds.

DC Fault Protection:

1. Connect the postive terminal of the DC Source to **TP1** and the negative terminal to **Ground**.
2. Measure the DC Voltage at TP2 using the voltmeter.

OUTPUT: TP2 should be +15 VDC. (Relay K1 De-Energized)

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[1] The following pins are electrically shorted Pin #1 to Pin #2, and Pin #6 to Pin #7.

[2] The signal generator for all tests shall be capable of providing a sine wave of 10 mVrms to 3.0 Vrms with a signal plus noise figure of > 0.01%.

[3] Refer to the owners manual for information on the unit voltage requirements.

COMPONENTS MOST LIKELY TO FAIL

POWER SUPPLY:
-voltage regulators REG1 (7815), REG 2 (7915)
-primary fuse FS1
-filter capacitors C406,407,417,418,419,420
-keep alive transformer T1
-power transformer T2
-bridge rectifiers Z401,Z402
-rectifier diodes D415,416,417,418
-turn-on relay K1

AMPLIFIER SECTION:

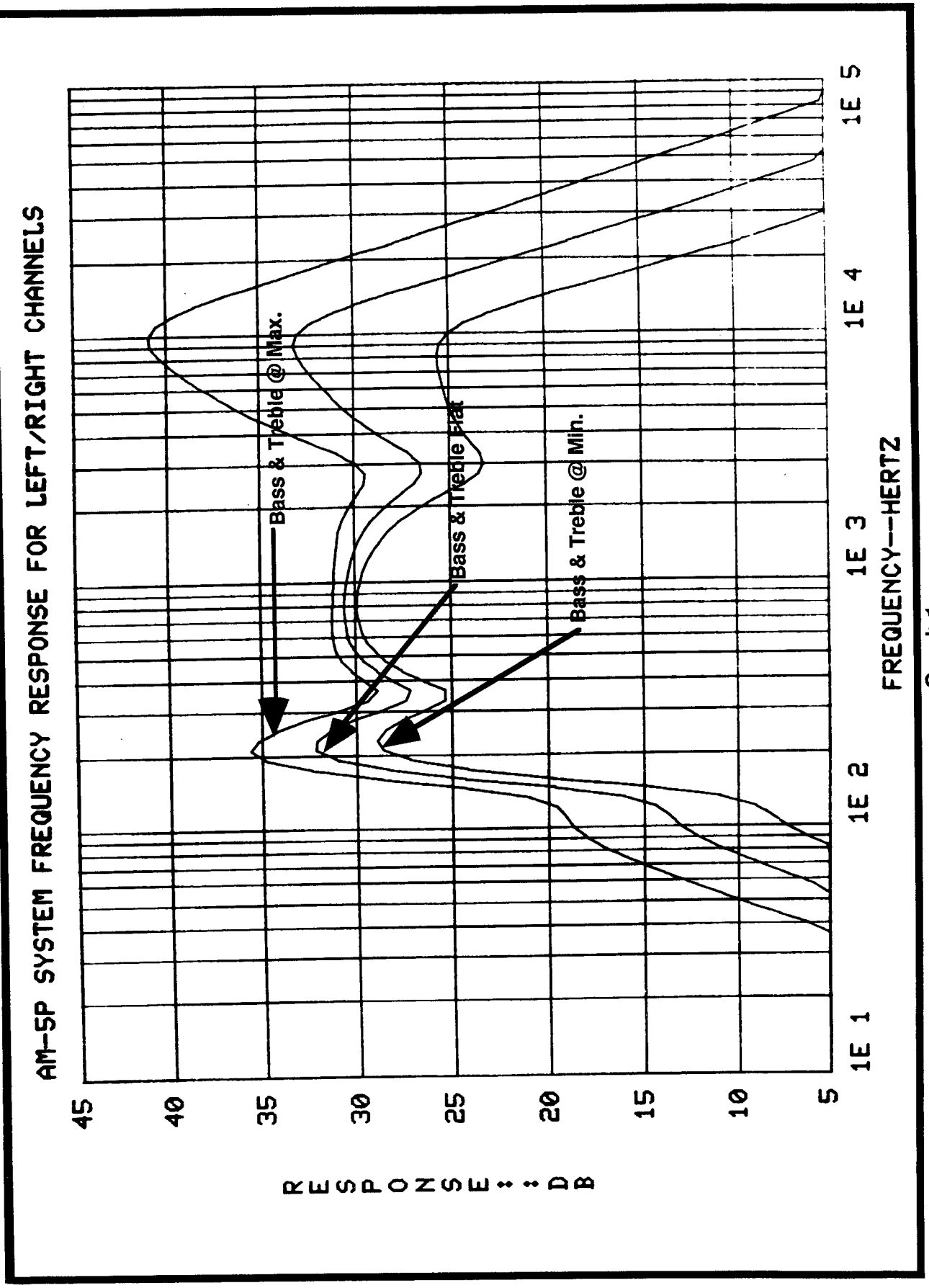
Bass Channel:
-output transistors Q333,337,338,344
-main driver transistors Q332,341
-class G driver transistors Q317,327
-fusing transistors Q319,329

Left Channel:
-output transistors Q318,322,323,330
-main driver transistors Q317,327
-class G driver transistors Q319,329
-fusing resistors R328,345,330,347,332,342

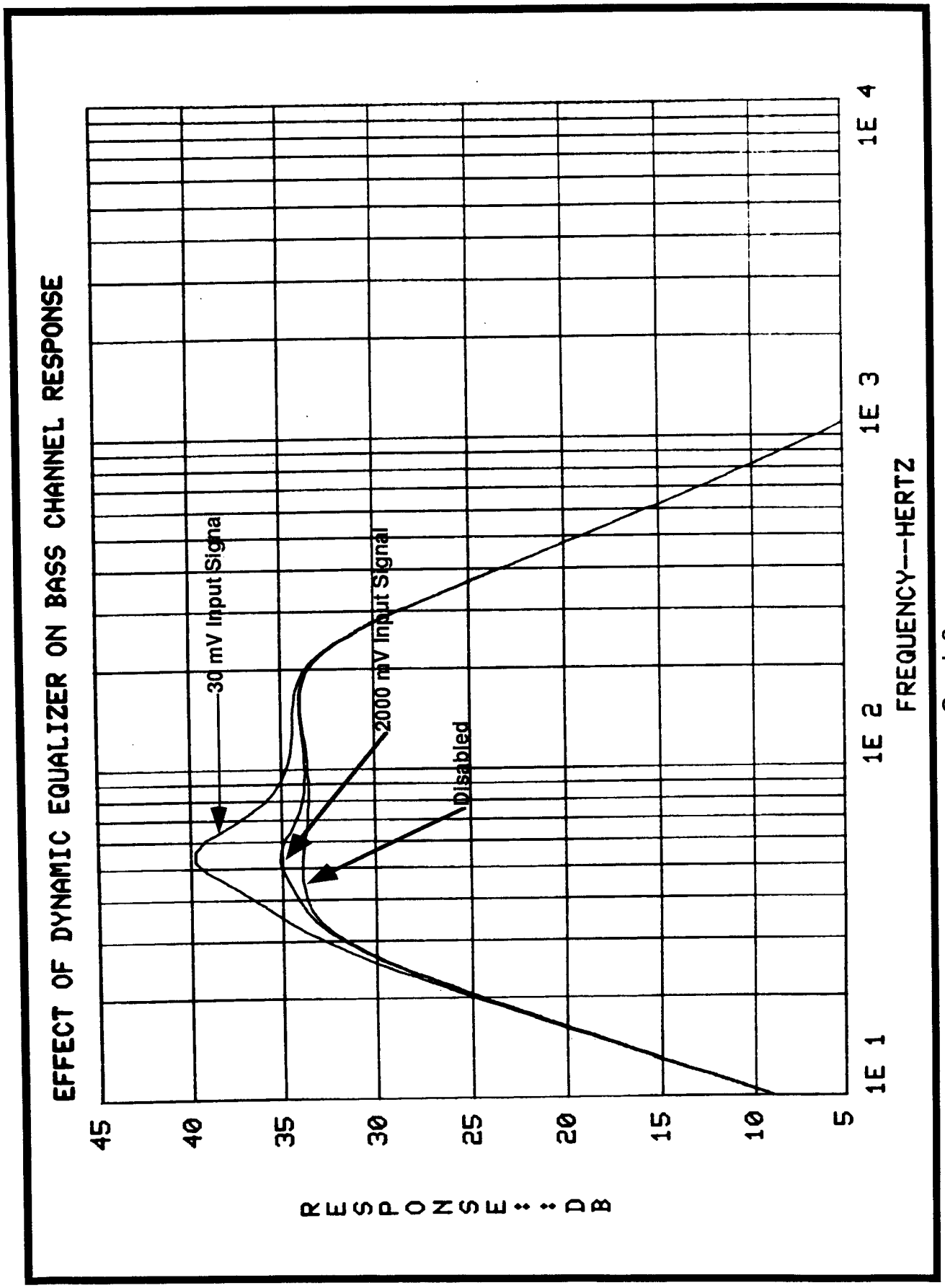
Right Channel:
-output transistors Q303,307,308,315
-main driver transistors Q302,312
-class G driver transistors Q304,314
-fusing resistors R303,319,305,321,307,322

INPUT CIRCUIT:
-resistors R201,202,203,204,212,213,214,215
-electrolytic capacitors C201,202,207,208
-protection diodes D101,102,103,104,105,106,107,108

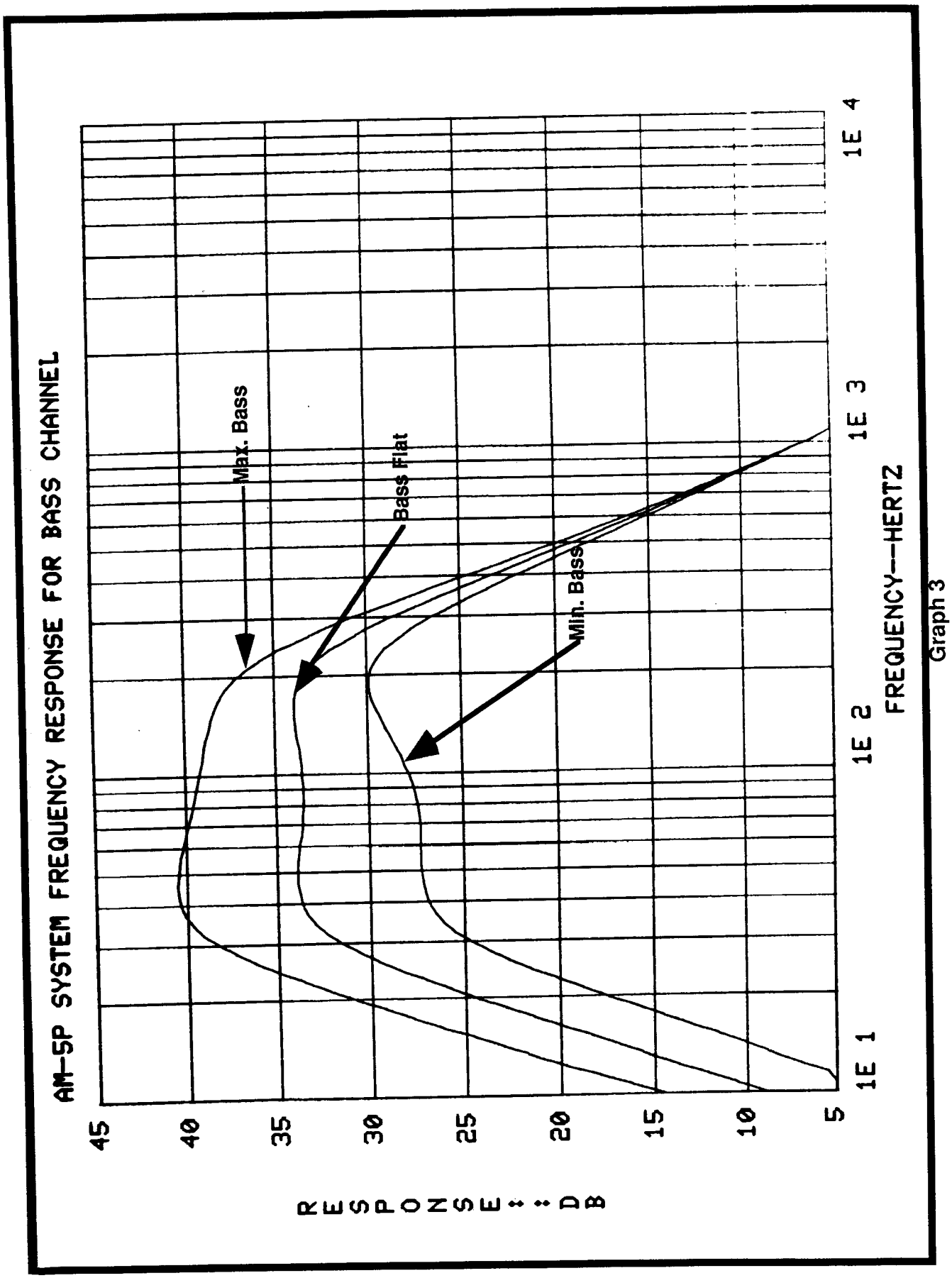
MISCELLANEOUS:
-tone control potentiometers VR501,VR502


AM-5P SYSTEM FREQUENCY RESPONSE FOR LEFT/RIGHT CHANNELS
RESPONSE - - DB
45
40
35
30
25
20
15
10
5
1E 1
1E 2
1E 3
1E 4
1E 5
FREQUENCY--HERTZ
Bass & Treble @ Max.
Bass & Treble Flat
Bass & Treble @ Min.

Graph 1

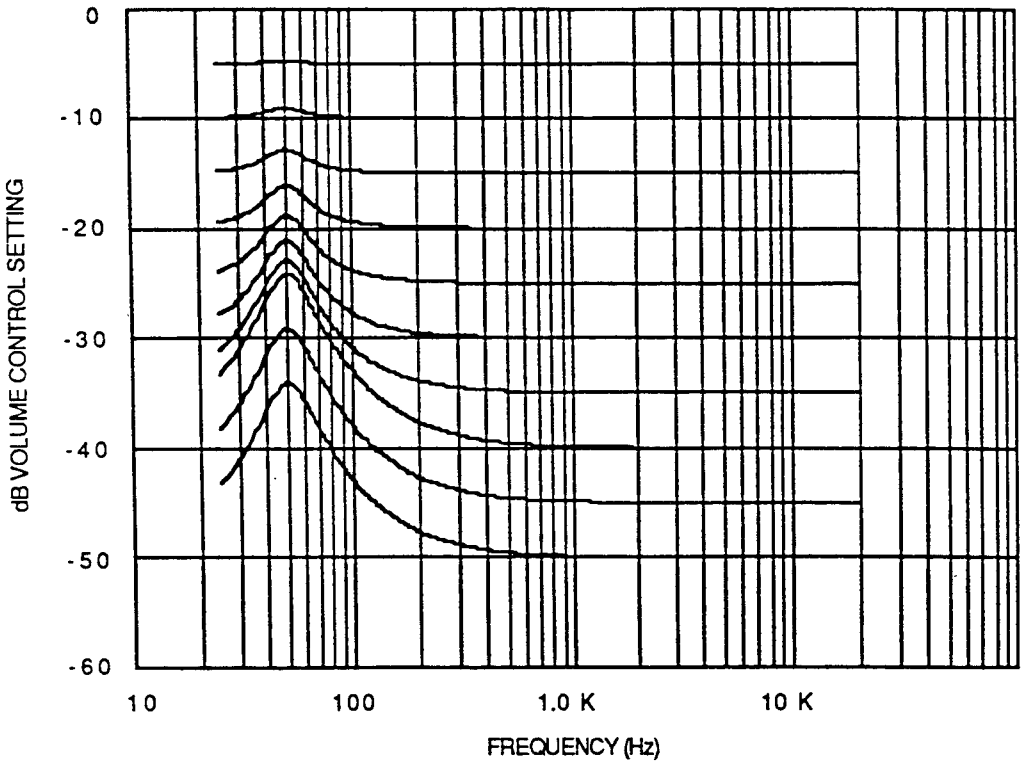

EFFECT OF DYNAMIC EQUALIZER ON BASS CHANNEL RESPONSE
30 mV Input Signa
2000 mV Input Signal
Disabled
RESPONSE - - DB
45
40
35
30
25
20
15
10
5
1E 1
1E 2
1E 3
1E 4
FREQUENCY--HERTZ

Graph 2

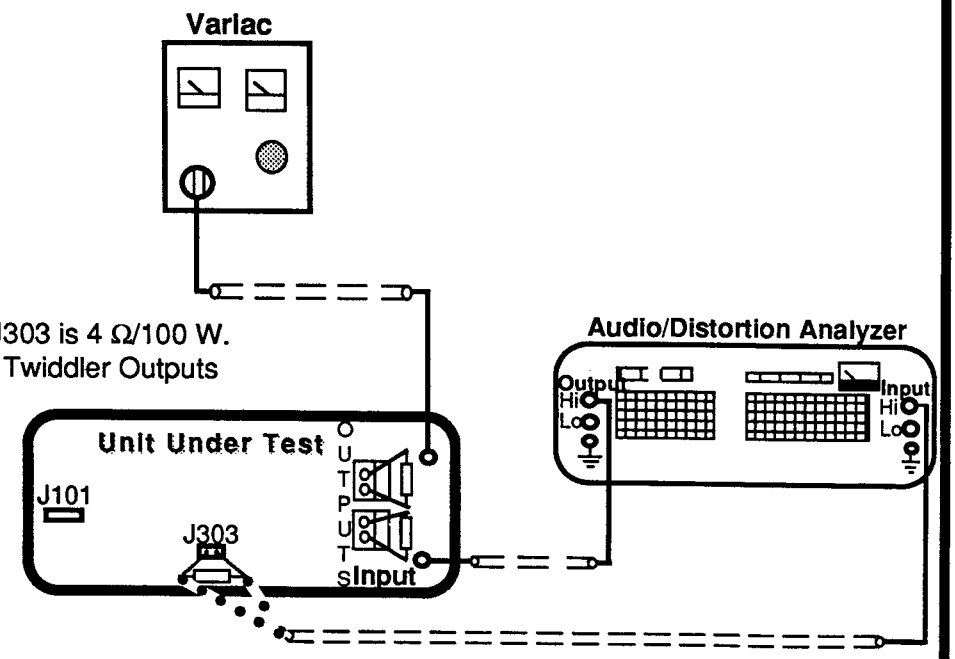

AM-SP SYSTEM FREQUENCY RESPONSE FOR BASS CHANNEL
Max. Bass
Bass Flat
Min. Bass
RESPONSE - - DB
45
40
35
30
25
20
15
10
5
1E 1
1E 2
1E 3
1E 4
FREQUENCY--HERTZ

Graph 3

Graph 4



UNCONVENTIONAL TEST SET-UP



NOTE:
Load Resistor across J303 is 4 Ω/100 W.
Load Resistors across Twiddler Outputs
8 Ω/50 W each.

Figure 3

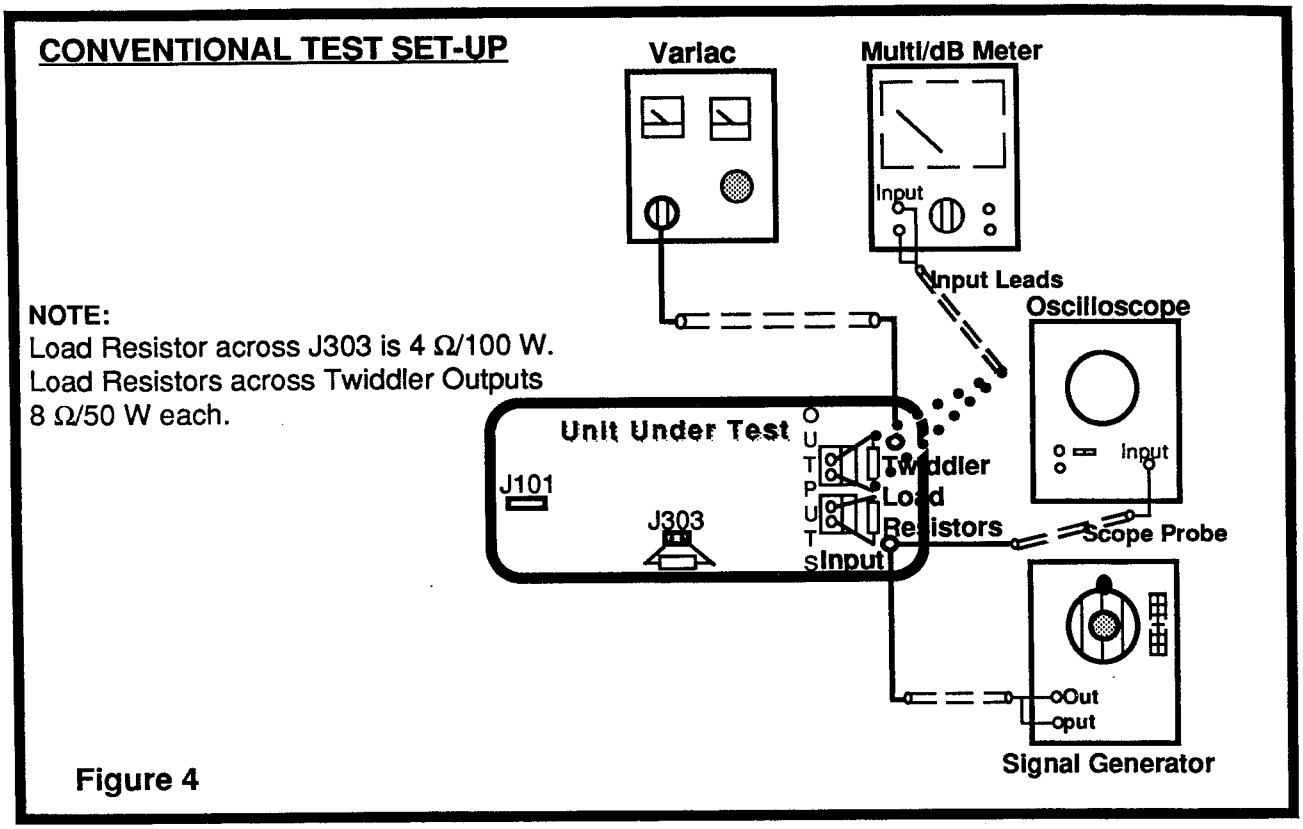


Figure 4

PARTS LIST

Part ##	Description	Designation	QTY
135792-1	Main PCB Ass'y	Audio Power Amp.	1
137222	Tone Control PCB Ass'y		1
141658	RFI Fixed PCB Ass'y	Left\Right Terminal Cups	2
141275	Nylon Bushing		14
141659	Bind Type (A)		7
141660	MTG Panel (UL/CA)		1
	Heat Sink (F)	Voltage Regulators Reg1, Reg2	2
141271	Heat Sink Coupler (Double)		1
141272	Heat Sink Coupler (Single)		1
141273	Heat Sink- Main		1
141274	Heat Sink- Small	Bridge Rectifier, Z401, Z402	1
141662	Eyelet, 2.0 mm Dia. x 3		5
141276	HeatSink Gasket		1
141277	Terminal Gasket		2
141278	Insulator (L)- SI Rubber	Bass. Amp Output Transistors	1
141279	Insulator (S)- SI Rubber	Left\Right Output Transistors	2
141280	Insulator SI-Rubber, TO 220 VAC W/Hole	REG 2	1
141281	Heyco Bushing (black) #SR-15-1		1
141282	Screw, M3 x 8 B/H Black	Speaker Terminal Cup	8
141283	Screw, 3 x 6 BH S.T. Heard Steel Zn	4 Heatsink Coupler, 2 REG	6
141284	S.T. Screw, 3 x 12 B/H ZN H.S.	1-Z01, 1-Z02	2
141285	S.T. Screw, 3 x 8 B/H H.S. BK	18- X'sistor, 2-EI-41 X'former, 11-Panel to Heatsink, 4-Heatsink Coupler to Heatsink, 2-PCB to small Heatsink	37
141663	Plain Washer, Dia. 4 x Dia. 10 x 0.8 THK	2-DIN Socket, I-Ground	3
141664	Nut, M4 x 0.7 x 3 THK	9-PCB, 2-DIN Socket, 1-Ground	12
141665	Int. Tooth Washer, Dia. 4 x 8.5 x 0.5 THK	9-PCB, 2-DIN Socket, 1-Ground	12
141666	Spring Washer, Dia. 4 x 7 x1.7 THK		1

Part ##	Description	Designation	QTY
141685	Capacitor, Elect; 470 µF/10 V, ±20%	C217	1
141686	Capacitor, Elect; 10 µF/25 V, ±20%	C201,202,207,208,216,219,220, 222,229,403, 405,408,409,422	14
141687	Capacitor, Elect; 100 µF/25 V, ±20%	C205,211,401	3
141287	Capacitor, Elect; 4700 µF/25 V, ±20%	C419,420	2
141688	Capacitor, Elect; 220 µF/35 V, ±20%	C407	1
141690	Capacitor, Elect; 470 µF/35 V, ±20%	C406	1
141691	Capacitor, Elect; 10 µF/50 V, ±20%	C425	1
141248	Capacitor, Elect; 10000 µF/50 V, ±20%	C417,418	2
141692	Capacitor, Elect; 1.0 µF/50 V, ±20%	C214,218,402	3
141693	Capacitor, Elect; 2.2 µF/50 V, ±20%	C113,126,206,212,404	5
144059	Capacitor, Ceramic, 100 pF/50V, ±10%	C127,128	2
141808	Capacitor, Ceramic, 330 pF/50V, ±10%	C319,320,321,322,323,324	5
141701	Capacitor, Ceramic, 1000 pF/50V, ±10%	C230	1
141702	Capacitor, Ceramic, 0.01 µF/50V, ±10%	C129,130,426	3
141809	Capacitor, Ceramic, 0.1 µF/50V, +80/-20%	C301,305,307,311,313,317,410,411,413,414, 415,416,421,423	14
141704	Capacitor, Ceramic, 0.01 µF/125V, ±100%	C412	1
141705	Capacitor, Ceramic, 0.001 µF/50V, ±5%	C203,204,209,214,215	5
141730	Capacitor, Ceramic, 0.01 µF/50V, ±5%	C107,108,120,121,228	5
141731	Capacitor, Ceramic, 0.1 µF/50V, ±5%	C224	1
141732	Capacitor, Ceramic, 0.12 µF/50V, ±5%	C104,105,117,118	4
141733	Capacitor, Mylar, 0.15 µF/50V, ±5%	C223,227	2
141734	Capacitor, Mylar, 0.0018 µF/50V, ±5%	C221	1
141735	Capacitor, Mylar, 0.0033 µF/50V, ±5%	C111,124	2
141811	Capacitor, Mylar, 0.047 µF/50V, ±5%	C101,102,114,115	4
141737	Capacitor, Mylar, 0.47 µF/50V, ±5%	C225,226	2
141738	Capacitor, Mylar, 0.082 µF/50V, ±5%	C109,110,122,123	4
141739	Capacitor, Mylar, 4700 pF/100V, ±5%	C302,304,308,310,314,316	6
141740	Capacitor, Mylar, 470 pF/100V, ±5%	C112,125	2
141741	Resistor, CF, 1.0 KΩ/.25W, ±5%	R129,159,226,238,254,306,308,314,316,323, 324,331,333,339,341,348,349,356,359,364, 371,372,418,426,430	25
141742	Resistor, CF, 10.0 KΩ/.25W, ±5%	R232,239,240,309,315,334,340,358,363,411, 415,417,421,424,434,435,439	17
141743	Resistor, CF, 100 KΩ/.25W, ±5%	R225,230,231,403,407,408,409,416	8
141812	Resistor, CF, 1.0 MΩ/.25W, ±5%	R406,428	2
141745	Resistor, CF, 12.0 KΩ/.25W, ±5%	R119,127,128,149,157,158,412	7
141813	Resistor, CF, 18.0 KΩ/.25W, ±5%	R248	1
141747	Resistor, CF, 200 Ω/.25W, ±5%	R311,336,361	3
141748	Resistor, CF, 2.0 KΩ/.25W, ±5%	R109,123,139,153,401,438	6
141749	Resistor, CF, 20.0 KΩ/.25W, ±5%	R126,156,207,218,233,235,402,404,405,410, 413,420	12
141750	Resistor, CF, 220 Ω/.25W, ±5%	R312,337,362,376,377,378	6
144760	Resistor, CF, 22.0 KΩ/.25W, ±5%	R124,154	2
141751	Resistor, CF, 2.4 KΩ/.25W, ±5%	R236	1
141752	Resistor, CF, 270 Ω/.25W, ±5%	R354,369	2
141753	Resistor, CF, 27.0 KΩ/.25W, ±5%	R247,249	2
141754	Resistor, CF, 300 Ω/.25W, ±5%	R208,219	2
141755	Resistor, CF, 30.0 KΩ/.25W, ±5%	R110,140	2
141756	Resistor, CF, 300 KΩ/.25W, ±5%	R241	1
141757	Resistor, CF, 33.0 KΩ/.25W, ±5%	R351,367	2
141758	Resistor, CF, 3.3 MΩ/.25W, ±5%	R419	1
141759	Resistor, CF, 390Ω/.25W, ±5%	R304,320,329,346,422	5
141760	Resistor, CF, 4.7 KΩ/.25W, ±5%	R101,131,211,220	4
141761	Resistor, CF, 47.0 KΩ/.25W, ±5%	R209,221,222,224,229,429	6
141762	Resistor, CF, 5.1 KΩ/.25W, ±5%	R130,160,255,325,350,373,414,425	8
141763	Resistor, CF, 51 KΩ/.25W, ±5%	R103,133	2
141764	Resistor, CF, 56 Ω/.25W, ±5%	R228	1
141765	Resistor, CF, 5.6 KΩ/.25W, ±5%	R258,427	2

Part ##	Description	Designation	QTY
141766	Resistor, CF, 680 Ω/.25W, ±5%	R257	1
141767	Resistor, CF, 6.8 KΩ/.25W, ±5%	R125,155,227,256,302,317,327,343,352,366, 436,437	12
141768	Resistor, CF, 750 KΩ/.25W, ±5%	R234	1
141769	Resistor, CF, 82 Ω/.25W, ±5%	R423	1
141770	Resistor, CF, 2.2 Ω/.5W, ±5% (Bulk)	R431,432	2
141771	Resistor, MF, 1.0 KΩ/.25W, ± 1%	R201,202,203,204,212,213,214,215	8
141772	Resistor, MF, 100 KΩ/.25W, ± 1%	R242	1
141773	Resistor, MF, 1.78 KΩ/.25W, ± 1%	R117,147	2
141774	Resistor, MF, 18.2 KΩ/.25W, ± 1%	R252	1
141775	Resistor, MF, 20.0 KΩ/.25W, ± 1%	R251,253	2
141776	Resistor, MF, 26.7 KΩ/.25W, ± 1%	R243,244	2
141777	Resistor, MF, 4.32 KΩ/.25W, ± 1%	R246	1
141778	Resistor, MF, 5.11 KΩ/.25W, ± 1%	R250	1
141779	Resistor, MF, 56.2 KΩ/.25W, ± 1%	R111,112,141,142	4
141780	Resistor, MF, 6.19 KΩ/.25W, ± 1%	R205,206,216,217	4
141781	Resistor, MF, 6.65 KΩ/.25W, ± 1%	R245	1
141782	Resistor, MF, 8.25 KΩ/.25W, ± 1%	R237	1
141783	Resistor, Metal Oxide, 0.120 Ω/1W,± 5%	R313,338	2
141286 ⚠	Resistor, Fusing, 100 Ω/.25W,± 5%	R353,368	2
141287 ⚠	Resistor, Fusing, 51 Ω/.25W,± 5%	R303,319,328,345	4
141288 ⚠	Resistor, Fusing, 5.1 Ω/.25W,± 5%	R305,321,330,347,355,370	6
141289 ⚠	Resistor, Fusing, 130 Ω/.5W,± 5%	R357,365	2
141290 ⚠	Resistor, Fusing, 200 Ω/.5W,± 5%	R307,322,332,342	4
116997	Diode, Switching, 1N4148	D101-116,301,302,304,308,309,311-314,316,318, 320,321,323-326,328,330,332,334,335,401-414, 419,420	55
141249	Diode, Silicon Rectifier, 1N4002, 1A, DO-41	D415,416,417,418	4
141250	Diode, Silicon Rectifier, 1N5402, DO201AD	D305,310,317,322,329,333	6
133134	Diode, Silicon Bridge, Rectifier, KBU6G KBU	Z401,402	2
141252	Diode, Zener, BZX55-C6V2, 6.2V/.5W	D117	1
141784	Housing Ass'y, 2P W(230 + 10)mm, AWG #20	Left/Right Channel	2
144761	Housing Ass'y, 2P W(305 + 35)mm, AWG #20	Bass Channel	1
144762	Housing Ass'y, 4P W(510 + 10)mm, AWG #30	J201	1
141787	Header, 2 Pin, Pitch = 3.96 mm	J301,302,303	3
141788	Header, 2 Pin, Pitch = 6.2 mm	J401	1
144763	Header, 2 Pin, Pitch=10 mm	J402	1
141790	Header, 4 Pin, Pitch= 2.5 mm	J201	1
141791	Header, 5 Pin, Pitch= 8 mm	J403	1
141792	Header, 7 Pin, Pitch= 2.5 mm	J101	1
144764	Header, 2 Pin, Pitch = 6.2 mm (LP021V)	J401	1
141253	DIN Connector,5 Pin	Audio & Control Signal I/P	1
141254	Speaker Cup, Body Rated 94HB	Speaker Terminal (L & R)	2
141255	Cable Ass'y	Stereo I/P	1
141256	Relay,10 A/250V,UL/CSA TV5,SEMKO,24VDC	REL. 1	1
141257	Fuse, 2.5A/250V, UL/CSA, Slow Blow Pigtail	FS 1	1
141258	Transistor Array, MPQ3904, P-Dip	U205	1
137653	Transistor, NPN, TIP35B, TO-218	Q337,344,	2
112286 ⚠	Transistor, NPN, 2SD415Q	Q312,327,341	3
141259 ⚠	Transistor, NPN, 2SC1627A, TO-92MOD	Q314,329,343	3
117921	Transistor, NPN, 2SC1815GR, TO-92	Q201,305,306,311,320,321,326,335,336,340, 401,402,404,405,406,407	16
141261	Transistor, NPN, 2SC2362E, TO-92	Q408	1
137651 ⚠	Transistor, NPN, BD243B, TO-220	Q307,315,322,330	4
137654 ⚠	Transistor, PNP, TIP36B, TO-218	Q333,338	2
112287 ⚠	Transistor, PNP, 2SB549Q	Q302,317,332	3
141262 ⚠	Transistor, PNP, 2SA817A, TO-92 MOD	Q304,319,334	3
119168 ⚠	Transistor, PNP, 2SA1015GR, TO-92	Q202,203,301,309,310,313,316,324,325,328, 331,339,342,403,409,410	16

Part ##	Description	Designation	QTY
137652 ⚠	Transistor, PNP, BD244B	Q303,308,318,323	4
141264 ⚠	X'former, EI-41, UL/CSA,W/Thermal Fuse	X'former 2	1
135964 ⚠	X'former, EI-96, UL/CSA,W/Thermal Fuse & Conn. Ass'y	X'former 1	1
107410	IC, Regulator, NJM7815A, +15V/1A	REG 1	1
107385	IC, Regulator, NJM7915A, -15V/1A	REG 2	1
141265	IC,JFET,LF351N, Wide-Band, I/P, Op-Amp	U301,302	2
125903	IC, JFET, LF411, Low Drift, Op-Amp, P-DIP	U303	1
119834	IC, OP-Transconductance-Amp, CA3080	U206	1
108568	IC, Dual Op-Amp, RC4558P, P-DIP	U101-104,201-203,207,208,401	10
141266	IC, Signal Level Sensor, NJM2072, P-DIP	U204	1
141267	AC Power Cord, UL/CSA, AWG #18 x 3C SVT,	W/terminal & WasherPower Cord	1
144065	Wire, Bare Jumper	J2,39,40,57,69,70,71	7
144066	Wire, Bare Jumper	J46,47,66	3
144067	Wire, Strand AWG #18, UL1007	Line Select	1
144068	Wire, Strand AWG #18, UL1007	GND4-GND2,P40-P40A	2
144069	Wire, Strand AWG #18, UL1007	N20-N20A	1
144070	Wire, Strand AWG #18, UL1007	N40-N40A	1
144071	Wire, Strand AWG #24, UL1007	SC-SC1	1
144072	Wire, Strand AWG #24, UL1007	N15-151,P15-P151	2
144073	Wire, Strand AWG #24, UL1007	AC-AC1	1
144074	Wire, Strand AWG #24, UL1007	RL-RL1	1
144075	Wire, Strand AWG #24, UL1007	DC8-DIN	1
	TONE CONTROL PCB ASS'Y		
141268	Resistor, Rotary 25KBX2,Linear W/Center Click	VR501,502	2
141815	Resistor, CF, 8.2 KΩ/.5W, ±5%	R501,502,508,509	4
141812	Resistor, CF, 1.0 MΩ/.5W, ±5%	R503,504,510,511	4
141813	Resistor, CF, 18.0 KΩ/.5W, ±5%	R506,507,513,514	4
141814	Resistor, CF, 24.0 KΩ/.5W, ±5%	R505,512	2
141811	Capacitor, Mylar, 0.047 µF/50V, ±5%	C503,504,508,509	4
141686	Capacitor, Elect; 10 µF/25 V, ±20%	C505,510	2
141807	Capacitor, Ceramic, 10 pF/50V, ± 5 %	C502,507	2
141810	Capacitor, Mylar, 0.0012 µF/50V, ±5%	C501,506	2
141700	Capacitor, Ceramic, 330 pF/50V, ± 10 %	C513,514	2
141809	Capacitor, Ceramic, 0.1 µF/50V, +80/-20 %	C511,512	2
141816	Connector Ass'y,7 Pin Housing & Board-In ,AWG #24	J501	1
141817	Wire Ass'y,AWG #20,VW-1 (75+5) mm	W/Washer Terminal Grounding	2
141818	PCB, Tone Control Board S/S PP 94HB,(62 x 65) mm	Tone Control PCB	1
127353	IC, Dual Op-Amp, NJM4558DA, P-DIP	U501	1
144076	Wire, Bare Jumper	J89	1
	TERMINAL CUP PCB ASS'y		
141823	Inductor, Coil Axail Lead, 0.5 µH, ±10%, Air Core	L301 or L302	1
144077	Resistor, CF, 10 Ω/.5W, ±5%	R375 or R374	1
144078	Capacitor, Mylar, 0.033 µF/50V, ±20%	C325 or C326	1
144079	PCB, RFI Fixed Board S/S Paper 94V-0	RFI Fixed PCB	1
135792-5	Amplifier	220 VAC	1
135792-3	Amplifier	100 VAC	1
135793-4	Amplifier	240 VAC	1
135793-5	Amplifier	240 VAC (Australia)	1
135793-6	Amplifier	120/240 VAC (Military)	1
135964 ⚠	Transformer	120 VAC	1
137819 ⚠	Transformer	220/240 VAC	1
137820 ⚠	Transformer	100 VAC	1
137821 ⚠	Transformer	115/230 VAC	1
137220	Woofer Cable		1
136140	Audio Input Cable		1

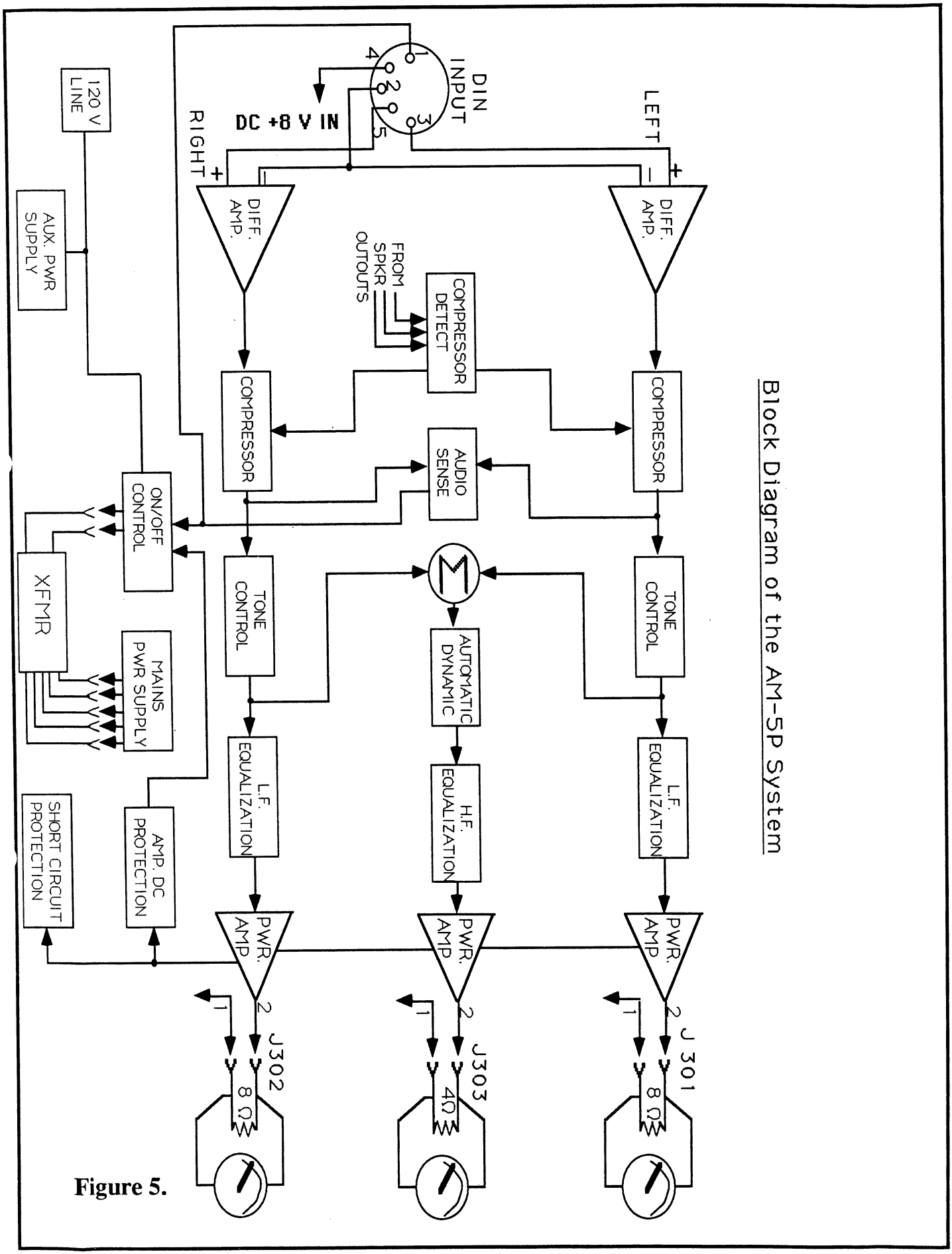
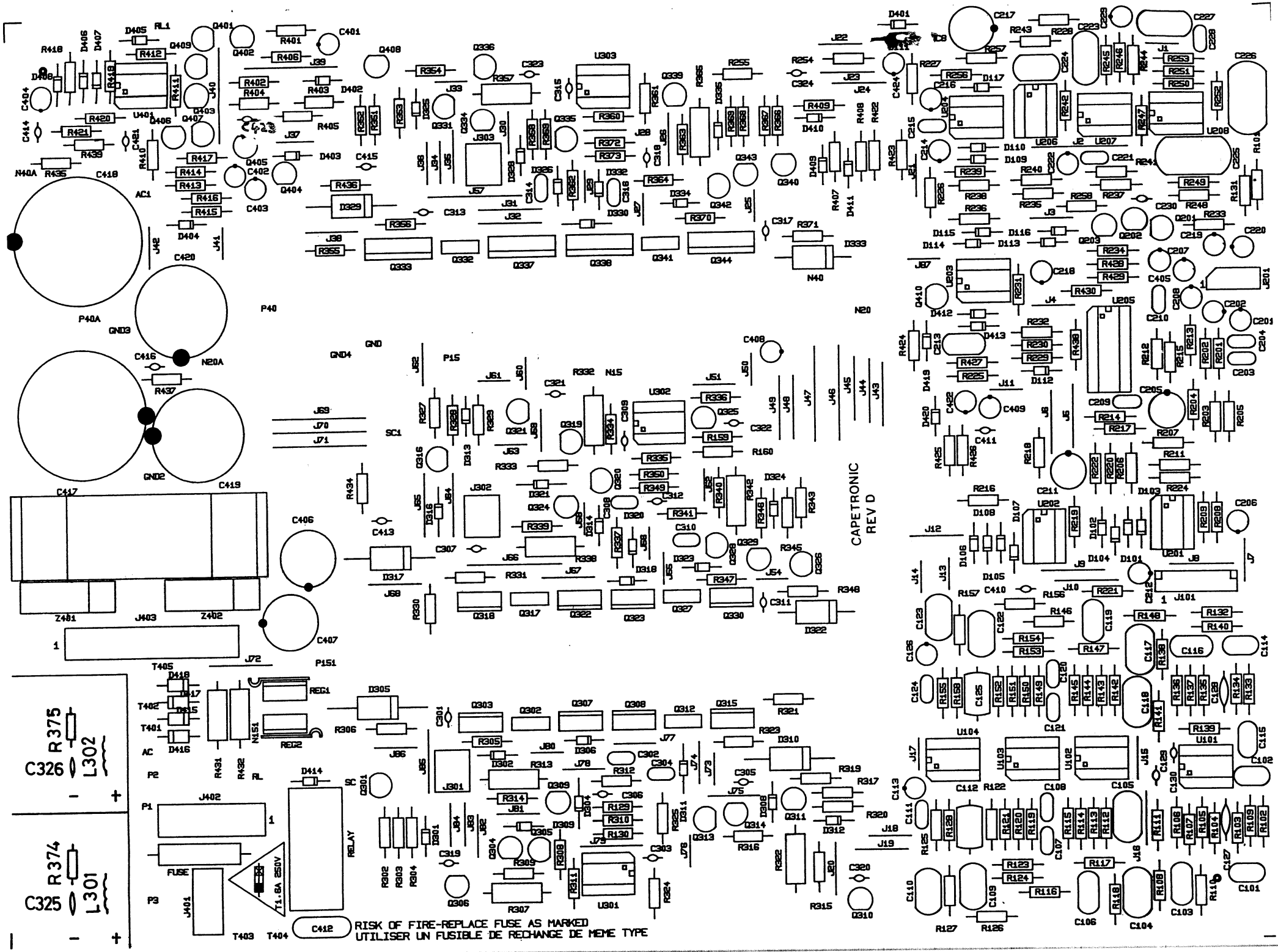

Block Diagram of the AM-5P System
DIN INPUT
DC +8 V IN
RIGHT
LEFT
DIFF. AMP.
DIFF. AMP.
FROM SPKR OUTOUTS
COMPRESSOR DETECT
COMPRESSOR
COMPRESSOR
AUDIO SENSE
120 V LINE
AUX. PWR SUPPLY
ON/OFF CONTROL
XFMR
MAINS PWR SUPPLY
TONE CONTROL
TONE CONTROL
AUTOMATIC DYNAMIC
L.F. EQUALIZATION
H.F. EQUALIZATION
L.F. EQUALIZATION
SHORT CIRCUIT PROTECTION
AMP. DC PROTECTION
PWR. AMP
PWR. AMP
PWR. AMP
J302
J303
J 301
8 Ω
4Ω
8 Ω

Figure 5.


CAPETRONIC
REV D
RISK OF FIRE-REPLACE FUSE AS MARKED
UTILISER UN FUSIBLE DE RECHANGE DE MEME TYPE
T1.6A 250V
C326 R375 L302
C325 R374 L301

TONE CONTROL PCB

RIGHT INPUT

LEFT INPUT

1/2 NJM4559

VR1A TREBLE

VR1B TREBLE

2 X 25K VR501

2 X 25K VR502

RIGHT

BASS

LEFT

DIN INPUT

J201

WHT SHIELD YEL RED

+R -L/R GND +L

DC8

TURN-ON DETECT

DC OFFSET DETECT

SHORT CIRCUIT PROTECT

LEFT OUT

RIGHT OUT

BASS OUT

SEE NOTE 13
"KEEP ALIVE"
TRANSFORMER 3VA

SEE NOTE 12

SEE NOTE 9

SEE NOTE 7

SEE NOTE 11

SEE NOTE 10

SEE NOTE 8

LINE CORD

FS1

POWER TRANSFORMER 150 VA

+V LOW (+20V)

-V LOW (-20V)

RIGHT CHANNEL EQUALIZATION

BASS CHANNEL EQUALIZATION

LEFT CHANNEL EQUALIZATION

SHORT CIRCUIT PROTECT

COMPRE
DETE

MUTE G

TO AMPLIFIERS

MUTE H

LEFT OUT

RIGHT OUT

BASS OUT

POWER AMPLIFIER

BASS OUT

Bass O
(

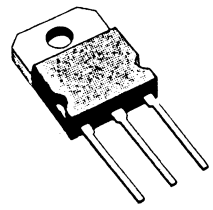
Lef

Driver Transistors (Hea
Green & Black
Note: Heatsink side is
Q302,332,317,3

Driver Transistors
Q304,314,319

All Other Sm
Signal Trans

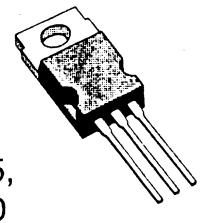
Bass Output (Heatsink)
Q333,337,338,344



B C E

TO-218

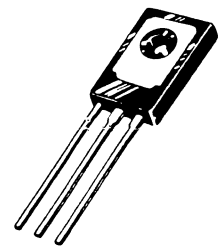
Left/Right (Heatsink)
Q303,307,308,315,
318,322,323,330



B C E

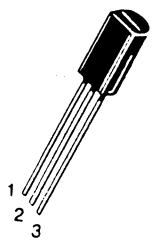
TO-220

Driver Transistors (Heatsink)
Green & Black
Note: Heatsink side is shown
Q302,332,317,341,312,327



B C E

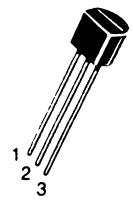
Driver Transistors
Q304,314,319,329,334,343



E C B ONE WATT
AMPLIFIER TRANSISTOR

TO-92

All Other Small
Signal Transistors



E C B

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS 1/4W, 5%
2. ALL NON-POLARIZED CAPACITOR ARE CERAMIC ±10%
3. ⚠ INDICATES CRITICAL SAFETY CONTROLLED COMPONENT. REPLACE ONLY WITH SAME TYPE.
4. DESIGNATORS WITHOUT ASSIGNED VALUES NOT PRESENTLY USED.
5. POWER AMP TRANSISTORS: ⚠

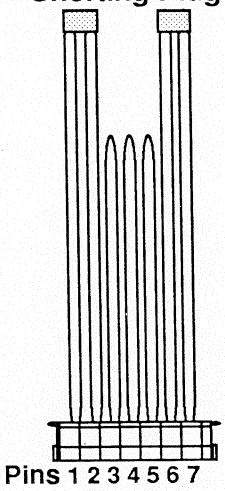
Q302, Q332, Q317 = NEC 2SB549Q
Q341, Q312, Q327 = NEC 2SD415Q
Q304, Q319, Q334 = NEC 2SA817A
Q314, Q329, Q343 = NEC 2SC1627A

	BOSE P/N	SGS P/N	MOTOROLA P/N
Q303, Q308, Q318, Q323	137652	137652-128B	SJE 2917
Q307, Q315, Q322, Q330	137651	137651-126B	SJE 2918
Q337, Q344	137653	137653-129B	SJH 1012
Q333, Q338	137654	137654-130B	SJH 1011

6. ALL DIODES ARE IN4148 UNLESS OTHERWISE NOTED.
7. POWER SWITCH USED ON VARIATIONS: 135792-2 (220V)
   135792-4 (240V)
8. TRANSFORMER T2, BOSE P/N 135964 FOR VAR-1 (120V)
   137819 FOR VAR-2,4 (220,240V)
9. FS1 = BEL 5STP 1.6 (VAR-2,4)
   " 5STP 2.5 (VAR-1)
10. JUMPER P3→P2 (VAR-2,1)
    P3→P1 (VAR-4)
11. RELAY K1=KOIKE MX-1 (VAR-2,4)
    " DEC-DH1U (VAR-1)
12. DIODES D415,416,417,418 = IN4002
13. XFMR=T1 TRANSFORMIC= P/N PT-3161 (VAR-2,4)
    PT-3209 (VAR-1)
14. ALL EQUALIZER STAGE CAPACITORS ARE POLYESTER FILM, ±5% (C101-C112, C114-C125, C223-C228, C501, 503, 504, 506, 508, 509).

FRONT VIEW

Shorting Plug



NOTE:
Pins 1 & 2, 6 & 7 are shorted

Figure 1

FRONT VIEW

View of DIN Connector

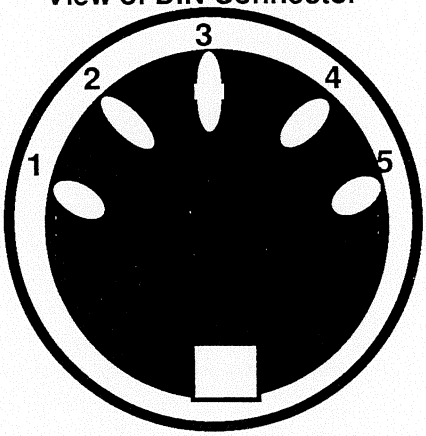
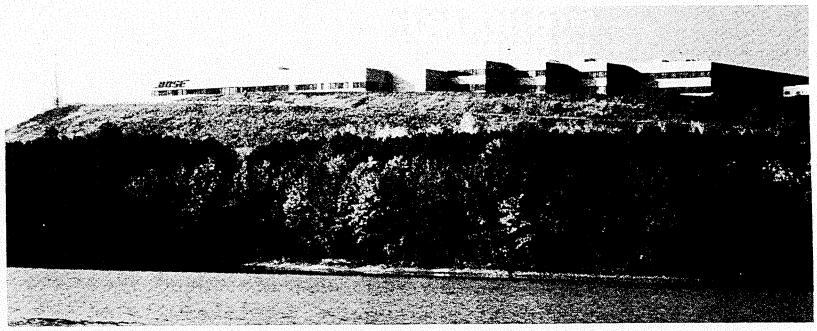


Figure 2



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